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Indian Standard

METHOD FOR QUANTITATIVE CHEMICAL ANALYSIS OF BINARY MIXTURES OF POLYPROPYLENE AND POLYETHYLENE

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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METHOD FOR QUANTITATIVE CHEMICAL ANALYSIS OF BINARY MIXTURES OF POLYPROPYLENE AND POLYETHYLENE

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Indian Standard

METHOD FOR QUANTITATIVE CHEMICAL ANALYSIS OF BINARY MIXTURES OF POLYPROPYLENE AND POLYETHYLENE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 15 November 1986, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 Two or more different types of fibres are mixed with one another for producing a variety of textiles; such a mixture may be composed of different types of man-made fibres or different types of natural fibres or both. The composition of mixtures of textile fibres is governed by the ultimate use to which the textile materials are to be put.

0.2.1 Mixtures of textile fibres are, being increasingly used for different purposes. The use of different fibres in textile mixtures has necessitated the formulation of standard methods of identification and quantitative estimation of fibres in mixtures. For the textile technologist as well as for the trader and the consumer, the quantitative analysis of textile fibres in mixtures is of considerable importance.

0.3 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes a method for the quantitative chemical analysis of binary mixtures; in any textile form such as fibre, yarn or fabric; of polypropylene and polyethylene.

NOTE — Before conducting an analysis according to this method, the fibres present in the mixture should be identified (*see* IS : 667-1981†) and the sample to be analysed should be free from all non-fibrous matter (*see* IS : 9068-1979‡). Dye in the dyed fibres is considered to be an integral part of fibre and is not to be removed.

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*Rules for rounding off numerical values (*revised*).

†Methods for identification of textile fibres (*first revision*).

‡Recommended methods for the removal of non-fibrous matter prior to quantitative analysis of fibre mixtures.

2. PRINCIPLE

2.1 A sample of the mixture is dried and weighed. Then polypropylene fibres in the sample are dissolved in cyclohexanone at 145°C. The residue, that is polyethylene is collected, washed, dried and weighed. From these two weighings, the proportion of polypropylene and polyethylene in the sample is calculated.

3. SAMPLING

3.1 The quantity of textile material of one definite type and quality delivered to the buyer against one despatch note shall constitute a lot.

3.1.1 If the textile material is fibre or yarn and the lot consists of more than 200 kg of fibre or yarn, it shall be divided into sub-lots each weighing 200 kg or less.

3.1.2 Each sub-lot shall be tested separately.

3.2 Sampling for Fibre and Yarn

3.2.1 From a sub-lot 15 increments, each weighing approximately 10 g, shall be taken from different parts and mixed thoroughly. This shall constitute a test sample.

3.3 Sampling for Fabrics

3.3.1 The number of piece to be selected shall be in accordance with Table 1. The piece thus selected shall constitute a gross sample.

TABLE 1 SAMPLE SIZE

LOT SIZE (PIECES)	SAMPLE SIZE (PIECES)
(1)	(2)
Up to 100	3
101 to 300	4
301 to 500	5
501 and above	7

3.3.2 From each piece in the gross sample selected as in **3.3.1**, cut out small portions from at least two different parts weighing about 25 g. The parts selected shall be as representative as possible of the gross sample. In the case of fabrics with a definite repetition in weave pattern, the parts selected shall include all yarns in the complete pattern. Dissect the small portions of fabric thus collected into yarns and mix them thoroughly. This shall constitute a test sample.

4. ATMOSPHERIC CONDITIONS

4.1 The test shall be conducted in the prevailing atmospheric conditions.

NOTE — Since dry weights are determined, it is not necessary to condition the sample.

5. APPARATUS AND REAGENT

5.1 Flat Bottom Flask — of 500 ml capacity, provided with a glass stopper.

5.2 Sintered Glass Filter Crucible — of appropriate capacity with pore size of 90 to 150 microns (porosity 1) and provided with a ground-glass stopper. If stopper is not available, the crucible should be enclosed in weighing bottle for weighing.

5.3 Heating Arrangement — for heating the flask and capable of maintaining a temperature up to 150°C.

5.4 Filter Flask — with connection to filter pump and adapter to enable the crucible (*see* **5.2**) to be fitted to filter flask.

5.5 Analytical Balance — Capable of weighing to an accuracy of 0·000 2 g.

5.6 Drying Oven — capable of maintaining a temperature of 105 ± 3°C.

5.7 Cyclohexanone — distilled quality.

5.8 Desiccator

6. PREPARATION OF TEST SPECIMEN

6.1 From the sample (*see* **3.2** *or* **3.3**) after removing size and finishes as recommended in IS : 9068-1979* draw a representative sample weighing about 2 to 3 g.

6.1.1 Take one test specimen of about 1 g. If the sample under analysis is yarn or fibre, cut the test specimen into pieces of approximately 25 mm length. If the sample under analysis is fabric, dissect the test specimen into yarns and cut the yarns into pieces of approximately 25 mm length.

6.1.2 Draw at least two test specimens.

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*Recommended methods for the removal of non-fibrous matter prior to quantitative analysis of fibre mixtures.

7. PROCEDURE

7.1 Take one of the test specimen of about 1 g from the pretreated sample (*see* **6**) and put it in the weighing bottle. Dry the pieces of the test specimen at 105 ± 3°C in the oven (for about three hours) to constant mass, cool it in a desiccator and determine its oven-dry mass.

7.2 Put all the pieces in the 500 ml flat bottom flask. Add required quantity of cyclohexanone to give material to liquor ratio of 1:100 and heat the flask and maintain the temperature 50 to 60°C for some time and then slowly raise the temperature to 145°C. Allow the mixture to stand in this condition for about 10 minutes, until the polypropylene is completely dissolved.

7.3 Remove the flask from the heating source and filter the solution hot through sintered glass filter crucible. The polyethylene portion will be left as residue.

7.4 Wash the residue with hot cyclohexanone and dry it at 105 ± 3°C for one hour. Cool in a desiccator and determine the oven-dry mass of the residue.

7.5 Test the other test specimen also as given in **7.1** to **7.4**.

8. CALCULATION

8.1 Calculate the percentage, by mass, of polyethylene in the test specimen by the following formula:

$$\text{Percent by mass, of polyethylene in the test specimen} = \frac{F}{W} \times 100$$

where

F = oven dry-mass of the residue of polyethylene (*see* **7.4**); and

W = oven-dry mass of the specimen (*see* **7.1**).

8.2 Determine the average of the two readings.

8.3 Determine the percentage weight of polypropylene by subtracting from 100 the value obtained in **8.2**.

9. REPORT

9.1 The report shall include the following information:

a) Type of material,
b) Percentage of component fibres, and
c) Number of test specimens tested.